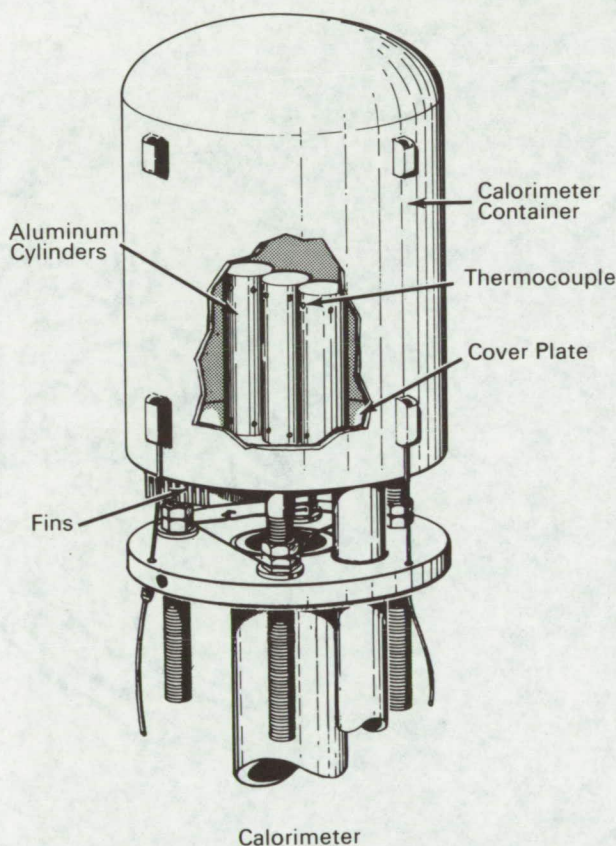


AEC-NASA TECH BRIEF



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Calorimeter Measures High Nuclear Heating Rates and Their Gradients Across a Reactor Test Hole



The solution:

Design of a pedestal-type calorimeter that can be used to measure gamma-ray heating rates from 0.5 to 7.0 watts per gram of aluminum.

How it's done:

The calorimeter consists of three aluminum cylinders (99.995% pure), as shown in the figure. One end of each cylinder is connected to a cover plate, the right side of which is maintained near cooling water temperature. The remaining surfaces of each cylinder are exposed to air at 1 mm of Hg pressure maintained inside the calorimeter container. The outer surfaces of the cover plate and calorimeter container are cooled with reactor cooling water, which is directed past the assembly by a shroud. As a steady-state gamma heating takes place in the cylinders, they develop a steady-state temperature distribution with the hottest point at the end of the cylinder inside the container, and the coldest point toward the wetted surface of the cover plate.

The nuclear heating rate is a function of cylinder ΔT measured by four chromel-alumel thermocouples attached to each cylinder, as shown in the figure, and known thermal conductivity of the material. The mid-point between the two sets of thermocouples is designed to be located at the core vertical midplane, when the capsule is inserted to the full-in position.

The design of the calorimeter is adequate over the range of 0.5 to 7.0 watts per gram of aluminum with system design operating parameters as follows:

Cooling water inlet temperature	135°F
Cooling water inlet pressure	235 psig
Cooling water flow rate	75 gpm
Vacuum on capsule	absolute

(continued overleaf)

The problem:

A program existed to determine radiation effects on materials by placing them adjacent to a test hole inside a nuclear reactor. To assess these effects, it was necessary to calibrate the gamma-induced heat generation rates and gradients across the test hole.

Note:

Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
AEC-NASA
Space Nuclear Propulsion Office
Washington, D.C. 20545
Reference: B70-10356

Patent status:

No patent action is contemplated by the AEC or NASA.

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